REL NORTHWEST
Regional Educational Laboratory at Education Northwest

ASK A REL RESPONSE

Technology Use in Schools

Recently Ask-A-REL responded to a request for analyses on the use of technology in schools, specifically, its effect on student engagement, school satisfaction, and connection with postsecondary and career options—and whether using technology in schools makes them more efficient or effective.

Because technology has so many facets, including (but not limited to) one-to-one use of devices, online learning, computer-assisted instruction, and access to the Internet, we included a sampling of the many rigorous research reviews that are representative of the body of work on these topics. We also conducted specific searches related to technology use in rural schools and included some of these most recent studies.

We conducted searches using Google Scholar and three databases: ERIC, Academic Search Premier, and Education Research Complete. Below are the results of our search. If there is no hyperlink in the citation, the articles are available upon request. All of the abstracts are excerpted or adapted from the authors. Please don't hesitate to contact jennifer.klump@educationnorthwest.org for additional assistance on this or other requests.

Association of Alaska School Boards, Consortium for Digital Learning. (2013). ***Association of Alaska School Boards 2011–2012 "iPad for Literacy" project: Executive summary.*** **Retrieved September 9, 2016, from http://cdl.aasb.org/wp-content/uploads/2013/02/Executive-Summary-HD6-iPad-Project.pdf**

The Association of Alaska School Boards, with the assistance of a legislative appropriation, implemented an "iPad for Literacy" demonstration project in Alaska House District 6. A study by the University of Alaska Fairbanks showed that participating students achieved success in language acquisition and reading fluency.

Billington, C. (2016). ***How digital technology can support early language and literacy outcomes in early years settings: A review of the literature.*** **London, England, UK: National Literacy Trust. Retrieved September 9, 2016, from http://www.literacytrust.org.uk/research/nlt_research/7213_how_digital_technology_can_support_early_language_and_literacy_outcomes_in_early_years_settings_a_review_of_the_literature**

This Ask-A-REL response was developed by REL Northwest under Contract ED-IES-12-C-0003 from the U.S. Department of Education, Institute of Education Sciences. The content does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

An emerging body of largely small-scale work shows technology can have a positive impact on early literacy outcomes. However, very little is known about whether technology impacts neurological development. This study reviews the research on these four questions:

- How can digital technology support practitioners to improve their practice in promoting babies' and young children's communication, language, and literacy?
- How can digital technology be embedded into the early years environment to promote babies' and young children's communication language and literacy?
- How can digital technology support the sharing of information with parents about ways they can support their child's communication, language, and literacy development?
- How can practitioners support parents to use digital technology to encourage their child's communication, language, and literacy?

Cheung, A. C., & Slavin, R. E. (2012). ***The effectiveness of educational technology applications for enhancing mathematics achievement in K–12 classrooms: A meta-analysis. Educator's summary*****. Baltimore, MD: Johns Hopkins University, Center for Data-Driven Reform in Education. Retrieved from http://www.bestevidence.org/word/tech_math_Apr_19_2012_sum.pdf**

This review summarizes research on the effects of technology use on mathematics achievement in K–12 classrooms. The main research questions included "Do education technology applications improve mathematics achievement in K–12 classrooms as compared to traditional teaching methods without education technology?" and "What study and research features moderate the effects of education technology applications on students' mathematics achievement?" The findings suggest educational technology applications produce a positive but small effect (ES = +0.16) on mathematics achievement. Supplemental computer-assisted instruction had the largest effect (ES = +0.19). The other two categories, computer-managed learning and comprehensive models, had much smaller effect sizes (+0.09 and +0.06, respectively).

Corry, M. (2016). Hispanic or Latino student success in online schools. ***International Review of Research in Open and Distributed Learning*****, *17*(3), 251–262. http://eric.ed.gov/?id=EJ1102722**

This study examines graduation and dropout rates for Hispanic or Latino K–12 students enrolled in fully online and blended public school settings in Arizona. The independent variables of school type (charter vs. noncharter) and delivery method (fully online vs. blended) were examined using multivariate and univariate methods on the dependent variable's graduation and dropout rates for Hispanic or Latino students. A comparison of mean dropout rates shows Hispanic or Latino students involved in K–12 online learning in Arizona are less likely to drop out of school if they are in a fully online learning environment versus a blended learning environment. Students, parents, teachers, administrators, instructional designers, and

policymakers can all use this and related research to form a basis upon which sound decisions can be grounded.

Davidson, C. M., & Santorelli, M. J. (2010). ***The impact of broadband on education: A study commissioned by the U.S. Chamber of Commerce.*** **Washington, DC: U.S. Chamber of Commerce. Retrieved September 9, 2016, from https://www.uschamber.com/sites/default/files/legacy/about/US_Chamber_Paper_on_Broadband_and_Education.pdf**

This report focuses on the ability of broadband to effect fundamental change in education, the many positive impacts this technology is having in a variety of educational settings, the barriers to further adoption and use, and recommendations for policymakers as they develop forward-looking educational policies. Although broadband is not a panacea for education reform, it is positioned to serve as an essential vehicle for delivering content and tools that can be used to spur student engagement, enhance learning outcomes, facilitate collaboration and innovation among educators, and enable cost savings in the administration of education.

Gemin, B., Pape, L., Vashaw, L., & Watson, J. (2015). ***Keeping pace with K–12 digital learning: An annual review of policy and practice*** **(12th ed.). Durango, CO: Evergreen Education Group. Retrieved September 9, 2016, from http://www.kpk12.com/wp-content/uploads/Evergreen_KeepingPace_2015.pdf**

This annual report examines the status of K–12 online education across the country. The report provides an overview of the latest policies, practices, and trends affecting online learning programs in all 50 states.

Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. ***Journal of Computer Assisted Learning*****, *32*(2), 139–156.**

The increased popularity of tablets in general has led to uptake in education. The authors critically review the literature reporting the use of tablets by primary and secondary school students across the curriculum, with a particular emphasis on learning outcomes. A total of 23 met the minimum quality criteria and were examined in detail (16 reported positive learning outcomes, 5 no difference, and 2 negative learning outcomes). Explanations underlying these observations were analyzed, and factors contributing to successful uses of tablets are discussed.

Harper, B., & Milman, N. B. (2016). One-to-one technology in K–12 classrooms: A review of the literature from 2004 through 2014. ***Journal of Research on Technology in Education*****, *48*(2), 129–142.**

This literature review examined empirical research conducted between 2004 and 2014 regarding one-to-one technologies in K–12 educational settings. The authors' overarching research question was: What does research tell us about one-to-one technology in K–12 classrooms? The

researchers used the constant-comparative method to analyze, code, and induce themes from 46 relevant articles. The findings showed the studies selected for analyses primarily concentrated on effects on student achievement, changes to the classroom environment, classroom uses, effects on learner motivation and engagement, and challenges to classroom integration. In this article, the authors define each of these themes, describe the implications of the use of technologies on a one-to-one basis in classrooms, and offer suggestions for future research.

Hassel, B. C., & Dean, S. (2015). ***Technology and rural education*****. Boise, ID: Rural Opportunities Consortium of Idaho. Retrieved September 9, 2016, from http://www.rociidaho.org/technology-and-rural-education/**

The authors propose a set of approaches for using technology to transform rural education and ameliorate some of the unique challenges rural schools face.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). ***Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*****. Washington, DC: U.S. Department of Education. http://eric.ed.gov/?id=ED505824**

This is one of the most recent reviews of online learning I found that included K–12. The meta-analysis of research from 1996 to 2008 included 51 studies. It found, on average, students in online learning conditions performed better than those receiving face-to-face instruction. The difference between student outcomes in online and face-to-face classes was larger in those studies contrasting conditions that blended elements of online and face-to-face instruction with conditions taught entirely face to face. Analysts noted these blended conditions often included additional learning time and instructional elements students in control conditions did not receive. This finding suggests the positive effects associated with blended learning should not be attributed to the media, per se. An unexpected finding was the small number of rigorous published studies contrasting online and face-to-face learning conditions for K–12 students. In light of this small corpus, caution is required in generalizing to the K–12 population because the results are derived mostly from studies in other settings (e.g., medical training and higher education).

Morgan, H. (2015). Online instruction and virtual schools for middle and high school students: Twenty-first-century fads or progressive teaching methods for today's pupils? ***Clearing House*****,** ***88*****(2), 72–76.**

Online education in K–12 settings has increased considerably in recent years, but there is little research supporting its use at this level. Online courses help students learn at their own pace, select different locations to do their work, and choose flexible times to complete assignments. However, some students learn best in a face-to-face environment. This article discusses the existing research on online education at the K–12 level and offers a few strategies to improve existing programs and help parents select good virtual schools for their children.

Morrison, G. R., Morrison, J. R., & Ross, S. M. (2016). ***A review of the research literature on the infusion of technology into the school curriculum.*** **Baltimore, MD: Johns Hopkins University, Center for Research and Reform in Education. Retrieved September 9, 2016, from http://education.jhu.edu/research/crre/_object_includes/A%20Review%20of%20the%20Research%20Literature%20on%20the%20Infusion%20of%20Technology%20into%20the%20School%20Curriculum.4.4.2016.pdf**

This review examines the results from many studies investigating the effectiveness of computer use in the classroom. The review looks at evaluations of several state initiatives, as well as one small district initiative, and the results of several meta-analyses. Results of the evaluation studies indicate one-to-one laptop projects lead to increased engagement of students in learning, increased interaction with peers, and increased student-centered instruction. Writing scores of students using laptops were higher compared with traditional classroom or desktop students, with one exception. Other than the lower algebra scores obtained in the Henrico County research, the studies also reported increases in mathematics, reading, and problem-solving performance. Another important finding was reduced disciplinary actions in the laptop groups, seemingly a function of students' increased engagement in learning.

O'Donnell, S., Beaton, B., McMahon, R., Hudson, H. E., Williams, D., & Whiteduck, T. (2016). ***Digital technology adoption in remote and northern indigenous communities in Canada*****. Paper presented at the annual conference of the Canadian Sociological Association, Calgary, Alberta. Retrieved September 9, 2016, from http://firstmile.ca/wp-content/uploads/2016-CSA-Digital-Technology-Adoption.pdf**

This paper is the most comprehensive review and analysis to date of the adoption and use of digital technologies in remote and northern indigenous communities in Canada. It is based primarily on a literature review and supplemented by personal communications with key informants, as well as the authors' analysis based on knowledge from extensive research and practical experience in the topic area. The authors begin by developing a "whole community" approach to understanding how remote indigenous communities adopt digital technologies for community, social, and economic needs. The literature highlights the role of digital technologies in community organizations and services, as well as the regional community intermediary organizations that support the development and sustainability of digital technologies and networks in indigenous communities. The review includes the current understanding of levels of digital technology adoption, how the communities are using digital technologies, and policies and programs to support digital technology adoption in indigenous communities. The conclusion highlights the main challenges to digital technology adoption in these unique remote and northern environments.

Rural Education and Technology Consensus Panel. (2015). How technology can boost productivity in rural school systems. In B. Gross & A. Jochim (Eds.), ***The SEA of the***

future: Vol. 4. Uncovering the productivity promise of rural education **(pp. 24–39). San Antonio, TX: Edvance Research, Building State Capacity and Productivity Center. http://eric.ed.gov/?id=ED562510**

Rural districts struggle to deliver the same educational experiences their larger suburban and urban peers provide, and often they operate with higher per-pupil costs and stretched budgets. Technology's ability to bridge distance, increase administrative efficiency, and customize experiences at relatively low cost holds great promise for rural communities working to improve outcomes for students and leverage their existing resources toward even greater impact. But to deliver on the promise of technology in rural education, policymakers need a better evidence base about how technology can be brought to bear on the challenges rural educators face, as well as what policies and systems need to be put into place to ensure it can be used. This chapter reports on the results of a national consensus panel to evaluate the role of technology in rural education and identify opportunities for states to support the use of technology. The consensus panel includes a mix of experts in rural education and technology, technical assistance providers, and researchers.

Sundeen, T. H., & Sundeen, D. M. (2013). Instructional technology for rural schools: Access and acquisition. *Rural Special Education Quarterly*, *32*(2), 8–14.

Integrating instructional technology into all classrooms has the potential to transform modern education and student learning. However, access to technology is not equally available to all districts or schools. Decreased funding and budgetary restraints have had a direct impact on technology acquisition in many rural school districts. One of the critical issues for obtaining instructional technology is to identify the most cost-effective resources. Compared with larger school districts, which may have readily available funding allocations for technology, rural districts have unique needs and may have to rely on alternative funding for instructional technology. This article addresses instructional technology types and availability, procurement options, and school or classroom grants available to rural school districts.

Note on criteria for inclusion

When REL Northwest reviews resources, we consider (among other things) the following four factors:

- ***Date of the publication***: We include only the most current information—typically published within the past five to ten years—unless we are unable to find recent studies on the topic or the requestor specifically asks us to include older studies.
- ***Source and funder of the report/study/brief/article***: Priority is given to U.S. Department of Education studies (specifically those produced by the Institute of Education Sciences), nationally funded research and technical assistance organizations, peer-reviewed journals, and certain other vetted sources known for strict attention to research protocols. We also consider educational policy organizations, such as Education Commission of the States, for policy-related requests.

- ***Methodology***: When the request is for research or evidence, we consider sources including randomized, controlled trial studies; surveys; self-assessments; literature reviews; and policy briefs. The reader should consider the following factors when basing decisions on these resources:
    - *Number of participants:* Only a few? Thousands?
    - *Selection:* Did the participants volunteer for the study, or were they chosen?
    - *Representation:* Were findings generalized from a homogeneous or a diverse pool of participants? Was the study sample representative of the population as a whole?
- ***Existing knowledge base***: Although we strive to include vetted resources, sometimes the research base is limited or nonexistent. In these cases, we have included the best resources we could find, which may include newspaper articles, interviews with content specialists, and organization websites. If the request is from practitioners, we strive to include vetted resources directed at this audience.